

**SECTION 01031****GRADES, LINES AND LEVELS****PART 1 - GENERAL****1.01 SCOPE**

This work of this Section comprises the establishing of grades, lines and levels.

**1.02 RELATED WORK**

Section 01720 - Project Record Documents

Section 01725 - Project As-Builts

**PART 2 - PRODUCTS****2.01 Materials:**

Furnish all stakes, templates and other materials necessary for establishing and maintaining of the lines and grades necessary for control and construction of the Work and all incidental labor necessary for the prosecution of the Work.

**PART 3 - EXECUTION****3.01 LAYOUT OF THE WORK:****A. GENERAL**

1. The Engineer of Record, through retaining the services of a Professional Surveyor, shall furnish the Contractor with horizontal and vertical controls which shall be utilized as specified elsewhere herein to layout the work. The Professional Surveyor hired by the Contractor shall verify all controls provided by the Engineer of Record and it shall be the responsibility of the Contractor to preserve same.
2. The Contractor shall retain the services of a Professional Surveyor who, shall furnish and set stakes, establishing line and grade and shall solely be responsible for the layout of the work as well as the recording of all as-built dimensions and elevations. The Contractor shall furnish all additional stakes, templates, and other materials for marking and maintaining survey points and lines given, and shall be responsible for their preservation. Should any of the horizontal and vertical control points set by the Engineer of Record be destroyed or disturbed, they shall be reset by the Contractor's Florida Registered Land Surveyor, at the Contractor's expense. All control points previously set by the Engineer of Record shall be verified by the Contractor's surveyor.

## B. LAYOUT

As provided in Subsection 3.01-A, above, the Contractor through the services of his Florida Registered Land Surveyor, shall establish the line and bench mark and other reference points for the pipeline or structure, as follows:

1. Structures: Will consist of baselines, stakes at building corners, centers and centerlines, auxiliary lines and two bench marks from which to establish the elevations. The Engineer of Record shall set a minimum of three horizontal and vertical control points which shall thereafter be maintained by the Contractor, without further help from the Engineer of Record, for use in establishing and checking the lines and grades as shown on the contract drawings.
2. Pipelines: Will consist of baselines, construction lines, centerlines, auxiliary lines and bench marks from which to establish the elevations. The Engineer of Record shall set horizontal and vertical control points at the beginning and end of the work and at a minimum distance of 1320 ft. in between. When the total distance is less than 1320 ft. control points shall be set at the beginning and end of the work.
3. The Contractor shall use this information to construct the structures and pipelines to the lines and grades shown on the project drawings and shall supply all equipment and personnel necessary to accomplish this end.
4. For pipelines, this will consist of establishing all points of bend (but not necessarily bevel pipe unless in close proximity to other facilities), valves, tees, crosses and other stations not more than 100 feet apart along the proposed centerline of the pipe, or along a stationed offset line as shown on the Plans, marked by a nail in a metal cap if in pavement, with the station painted nearby or by a nail in the top of a wooden stake driven flush with the ground with the station marked on the flag stake nearby, if not in pavement.
5. The Contractor shall supply the Department Inspector with a copy of the Registered Land Surveyor's layout of the work immediately upon it's availability to his own forces.
6. The Contractor shall make his equipment and men available to the Inspector for spot checking the accuracy of the pipe laying. The Inspector shall require the Contractor to correct pipe alignment when necessary.

## C. RECORD DRAWINGS:

1. During the entire construction operation, the Contractor shall retain the services of a State of Florida Registered Land Surveyor who shall maintain records of the installation, including all deviations from the Plans and Specifications by obtaining "as-built" dimensions and elevations.
2. The Surveyor shall prepare therefrom Record As-Built Drawings showing correctly and accurately all changes and deviations made during construction, including approved construction variances, to reflect the work as it was actually constructed.
3. Refer to Sections 01720 and 01725 for Department's criteria for developing project record documents and record As-Built drawings.

#### D. HORIZONTAL AND VERTICAL CONTROL FOR DESIGN

The following shall apply when establishing horizontal and vertical controls for design. They shall also be used for the development of construction drawings.

- A. Survey stationing shall proceed from south to north and/or from west to east.
- B. Baseline or centerline shall be tied to section corners, or to monument lines or to right-of-way lines.
- C. Points along the survey line shall be referenced to perpetuate the alignment. Whenever possible, the reference points shall be established at right angles to the survey line and at intervals no longer than 1,400 feet. Reference points shall be shown on construction plans.
- D. Centerline of side streets shall be established and set by nail and disc. Station and angle turned shall be given and shown on the plans.
- E. All curve data (horizontal) shall be shown on Plans. Point of curvature and point of tangency shall be set in the field, reference P.C. and P.T. or P.I.
- F. Easement lines shall be tied to baseline or centerline. Give station and angle turned.
- G. Set centerline or baseline stations every 100 feet on the ground using iron rods in unpaved areas or P.K. nails on asphalt.
- H. On vertical control refer to datum used (such as NGVD, City of Miami). Assumed datum will be used only with prior written approval by the Department and under no circumstances shall the elevation assumed be less than 100.00.
- I. Temporary bench marks (T.B.M.) and bench marks shall be established throughout the project at approximately 1,000 feet intervals. Show information on plans
- J. Centerline shall be tied to baseline if different from each other.
- K. Tie proposed pipe to centerline or baseline, not to right-of-way line. Right-of-way line shall be tied to centerline or baseline.
- L. All survey information shall be shown on the plans.
- M. All point of intersections and deflection angles shall also be shown. Angle can be submitted by bearings.

END OF SECTION